THE SPECIES CONCEPT *

Theodosius Dobzhansky
Columbia University, New York

In sexually reproducing and cross-fertilizing organisms populations differing in two or more genes may preserve their integrity only if their interbreeding, and therefore gene exchange between them, is prevented by some means. Interbreeding of races of the same species is prevented typically by geographical isolation; where the distribution areas of races come in contact, hybridization takes place, and a more or less broad zone populated by intermediates is formed. As races diverge in the process of evolution, they become capable to co-exist in the same territory. The fact of two or more species occurring in the same territory (sympatric species) without formation of intermediates proves that their interbreding is prevented by one or several isolating mechanisms; such isolating mechanisms are rooted in the physiology of the species concerned, and may be called reproductive isolating mechanisms, to distinguish them from geographical isolation, which is, in general, extrinsic to the organism itself. Many reproductive isolating mechanisms are known: ecological, seasonal, sexual or psychological, mechanical isolation, inviability of hybrids, hybrid sterility, etc. The development of reproductive isolation between two or more related populations may reasonably be considered the attainement by these populations of the rank of separate species. It is evident that, since the development of reproductive isolation is in most cases a gradual process, there must be found in nature species in statu nascendi, that is cases which can be

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* *Introdução à discussão das 14 horas do dia 24-7-43*

classified either as very distinct races os as very close species. However, in most instances the presence of reproductive isolation is so evident that the species concept based on the above criterium has a perfectly objective validity.

The methods of delimiting species used by modern systematists may be regarded as furnishing indirect evidence on the presence or absence of reproductive isolation between the population groups classified. The practice of modern systematists shows that species existing in the same territory (sympatric) may be delimited without undue difficulties. The difficulties are frequently encountered where populations residing in different territories (allopatric) are involved. This is quite intelligible, since in the latter cases it is difficult to find out whether reproductive isolation is present and to what degree. The only practical, although clearly imperfect, method applicable to allopatric species is judgement by analogy: if allopatric forms show a degree of morphological distinctness comparable in extent to that found between known sympatric species, the allopatric forms are probably also species. This, evidently, involves the tacit assumption that development of reproductive isolation goes hand in hand with morphological differentiation. Anyway, what matters is whether the populations concerned actually do or do not exchange genes in nature, and if they dont, whether it is because they are prevented from doing so by their physiologies or merely by geographic isolation. Thus, laboratory experiments furnish valuable information for distinguishing species, but the results of laboratory experiments must be very carefully evaluated against the natural conditions to prevent misinterpretation.

In organisms that reproduce by obligatory self-fertilization, parthenogenesis, or asexually, the concept of "species" developed for cross-fertilizing forms has no validity.